

U.S. Application Serial No. 10/645,308
Amendment After Final dated November 22, 2005
In response to Final Office Action dated September 22, 2005

Amendments to the Claims:

This listing will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A dual damascene interconnect structure, comprising:
 - a patterned multilayer of dielectrics on a substrate, comprising:
 - a cap layer;
 - a first non-porous via level low-k dielectric layer having thereon metal via conductors with a bottom portion and sidewalls;
 - an etch stop layer;
 - a first porous low-k line level dielectric layer having thereon metal line conductors with a bottom portion and sidewalls;
 - a polish stop layer over said first porous low-k dielectric;
 - a second thin non-porous low-k dielectric layer for coating and planarizing the line and via sidewalls; and
 - a liner material between said metal via and line conductors and said dielectric layers, layers;
 - wherein the second thin non-porous low-k dielectric layer has a composition that is covalently bonded with the first non-porous via level low-k dielectric layer and the first porous low-k line level dielectric layer for enhanced adhesion; and
 - wherein said second thin non-porous low-k dielectric layer is selected from the group consisting of: HOSP™, HOSP BEST™, Ensemble™ Etch Stop, Ensemble™ Hard Mask, AP 6000™, organo silsesquioxanes, hydrido-organo silsesquioxanes, siloxanes, silicon oxides, SiLK™, GX-3™ and a combination thereof.

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2. (Original) The dual damascene structure of claim 1, wherein said porous and said first non-porous low-k dielectric layers form covalent bonds with said etch stop layer.

3. (Original) The dual damascene structure of claim 1, wherein said first non-porous low-k dielectric layer has a material that is covalently bound to said etch stop layer.

4. (Original) The dual damascene structure of claim 3, wherein said covalently bound material is selected from the group consisting of: SiLKTM, GX-3TM, organic material and a combination thereof.

5. (Original) The dual damascene structure of claim 1, wherein said first porous low-k dielectric layer has a material that is covalently bound to said etchstop layer.

6. (Original) The dual damascene structure of claim 1, wherein said first porous low-k dielectric layer has a material selected from the group consisting of: porous SiLKTM, porous GX-3pTM, porous organic material and a combination thereof.

7. (Original) The dual damascene structure of claim 1, wherein said first porous low k dielectric material has pores with a pore size greater than 2 nm.

8. (Original) The dual damascene interconnect structure of claim 1, wherein said

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first non-porous low k dielectric and said first porous low k dielectric layers have identical chemical compositions.

9. (Original) The dual damascene interconnect structure of claim 1, wherein said first non-porous low k dielectric layer, said first porous low k dielectric and said second thin non-porous low k dielectric layer are organic.

10. (Original) The dual damascene interconnect structure of claim 1, wherein said etch stop layer and said second thin non-porous low k dielectric layer are silicon containing.

11. (Original) The dual damascene interconnect structure of claim 1, wherein said etch stop layer is silicon containing.

12. (Original) The dual damascene interconnect structure of claim 1, wherein said second thin non-porous low-k dielectric layer and said first non-porous low-k dielectric layer have identical compositions.

13. (Original) The dual damascene interconnect structure of claim 1, wherein said second thin non-porous low-k dielectric layer has the same chemical composition as said etch stop layer.

14. (Original) The dual damascene interconnect structure of claim 1, wherein said second thin non-porous dielectric layer has a thickness of about 20 Å to about 100 Å.

15. (Cancelled)

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16. (Canceled)

17. (Original) The dual damascene interconnect structure of claim 1, wherein said second thin non-porous low-k dielectric layer conformally coats the line and via sidewalls.

18. (Original) The dual damascene interconnect structure of claim 1, wherein said porous low-k dielectric layer has a thickness of about 600 Å to about 5000 Å.

19. (Original) The dual damascene interconnect structure of claim 1, wherein said etch stop layer has a chemical composition comprising silicon, carbon, oxygen and hydrogen.

20. (Original) The dual damascene interconnect structure of claim 1, wherein said etch stop layer is comprised of a spin-on material with etch selectivity to said porous low-k dielectric.

21. (Original) The dual damascene interconnect structure of claim 1, wherein said etch stop layer is selected from the group consisting of: HOSP™, HOSP BEST™, Ensemble™ Etch Stop, Ensemble™ Hard Mask, AP 6000™, organo silsesquioxanes, hydrido silsesquioxanes, hydrido-organo silsesquioxanes, siloxanes, silicon carbides, silicon oxides and a combination thereof.

22. (Original) The dual damascene interconnect structure of claim 1, wherein said etch stop layer has a thickness of about 50 Å to about 600 Å.

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23. (Original) The dual damascene interconnect structure of claim 1, wherein said liner material comprises one or more metals selected from the group consisting of: Ti, TiN, Ta, TaN, W, TiW, TaSiN, WN, nitrides thereof and a combination thereof.

24. (Original) The dual damascene interconnect structure of claim 1, wherein said liner material is a material deposited by sputter deposition, physical vapor deposition (PVD), chemical vapor deposition (CVD), ionized physical vapor deposition (Ionized PVD), atomic layer deposition (ALD) and any combination thereof.

25. (Original) The dual damascene interconnect structure of claim 1, wherein said liner material is continuous and does not penetrate into said porous dielectric.

26. (Original) The dual damascene interconnect structure of claim 1, wherein said liner material has a sharp planar interface to the dielectric layers.

27. (Original) The dual damascene interconnect structure of claim 1, wherein said metal conductor is a patterned metal conductor comprising a metal selected from the group consisting of: aluminum, copper, tungsten, gold, silver and alloys thereof.

28. (Original) The dual damascene interconnect structure of claim 27, wherein at least one of said patterned metal conductors is an electrical via.

29. (Original) The dual damascene interconnect structure of claim 1, wherein at least one of said patterned metal conductors is a line connected to said via.

30. (Original) The dual damascene interconnect structure of claim 1, wherein said first non-porous low-k dielectric layer has a metal via formed therein.

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31. (Original) The dual damascene interconnect structure of claim 1, wherein said first porous low-k dielectric layer has a metal line formed therein.

32-65 (Canceled)